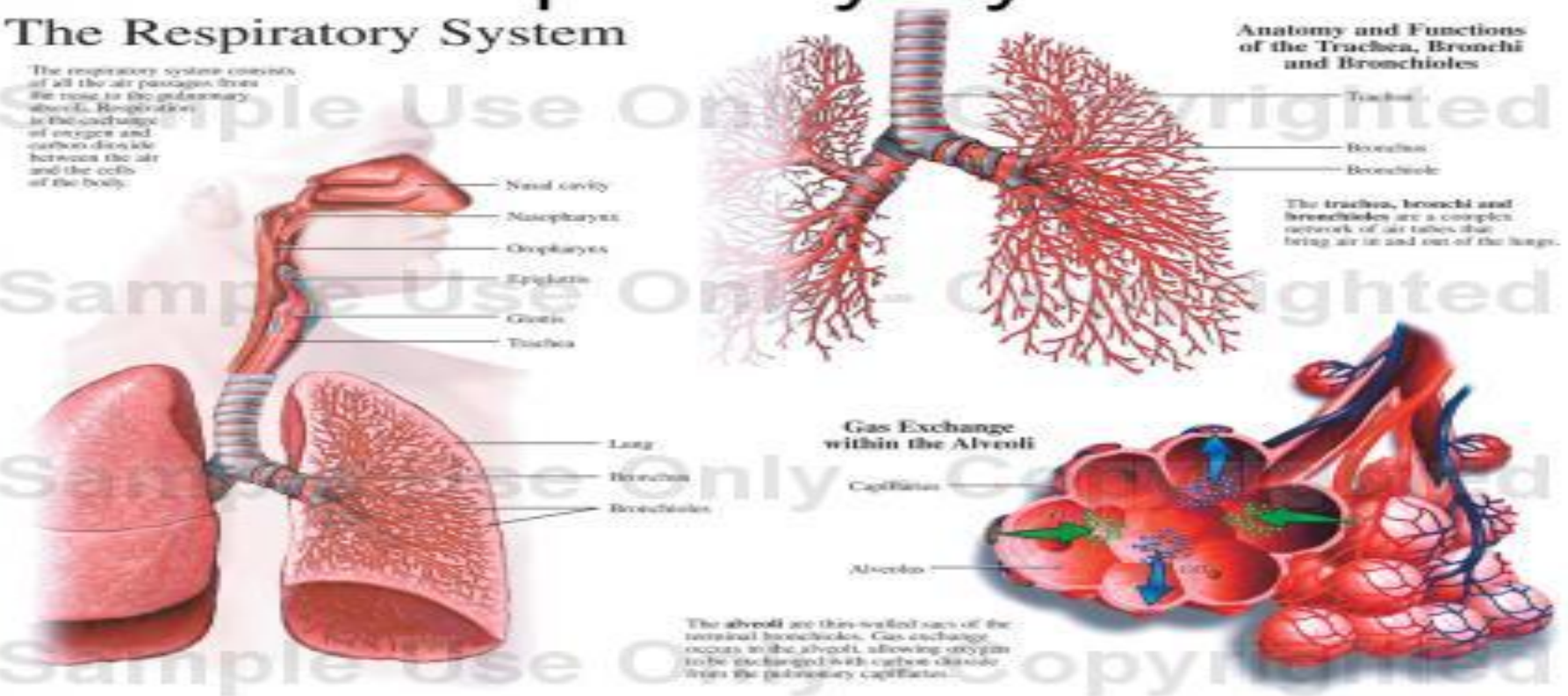
Anatomy and Functions of the Respiratory System



For

Critical Care Nursing Students

A.Shahrokhi, MSc.
Qazvin Nursing & Midwifery School
Fall 2016

VENTILATION

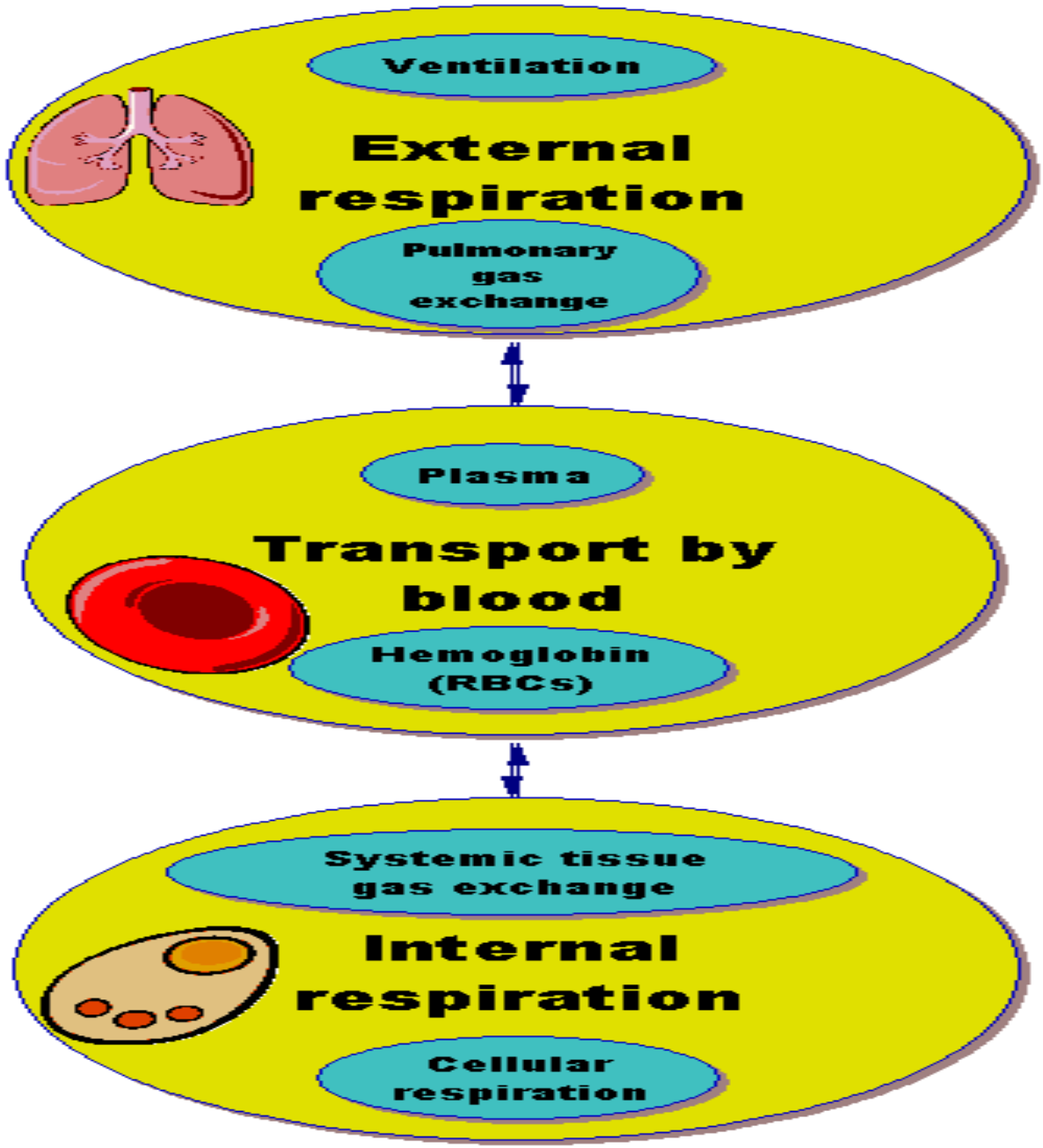
RESPIRATION

What's RESPIRATION?

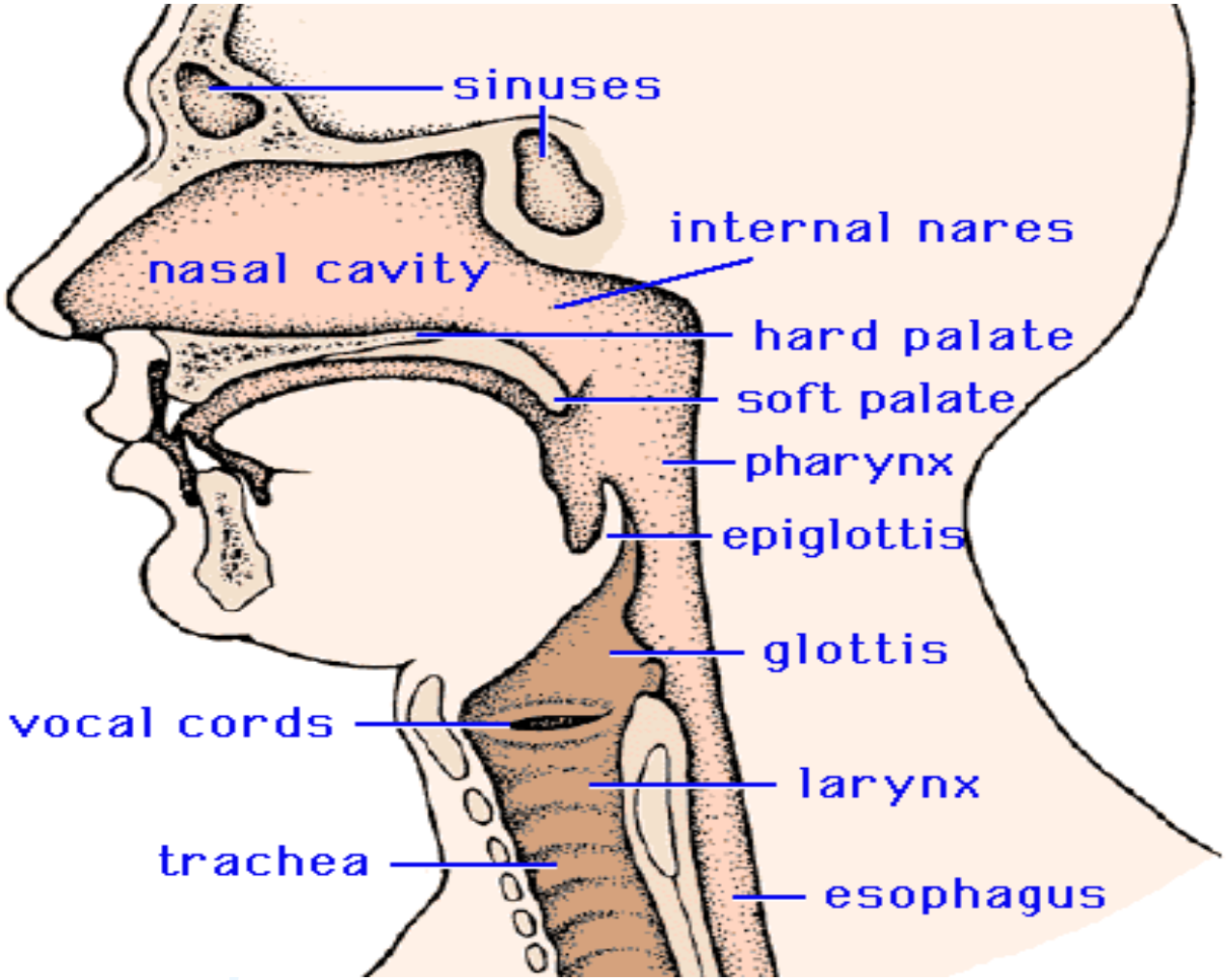
BREATHING

OXYGENATION

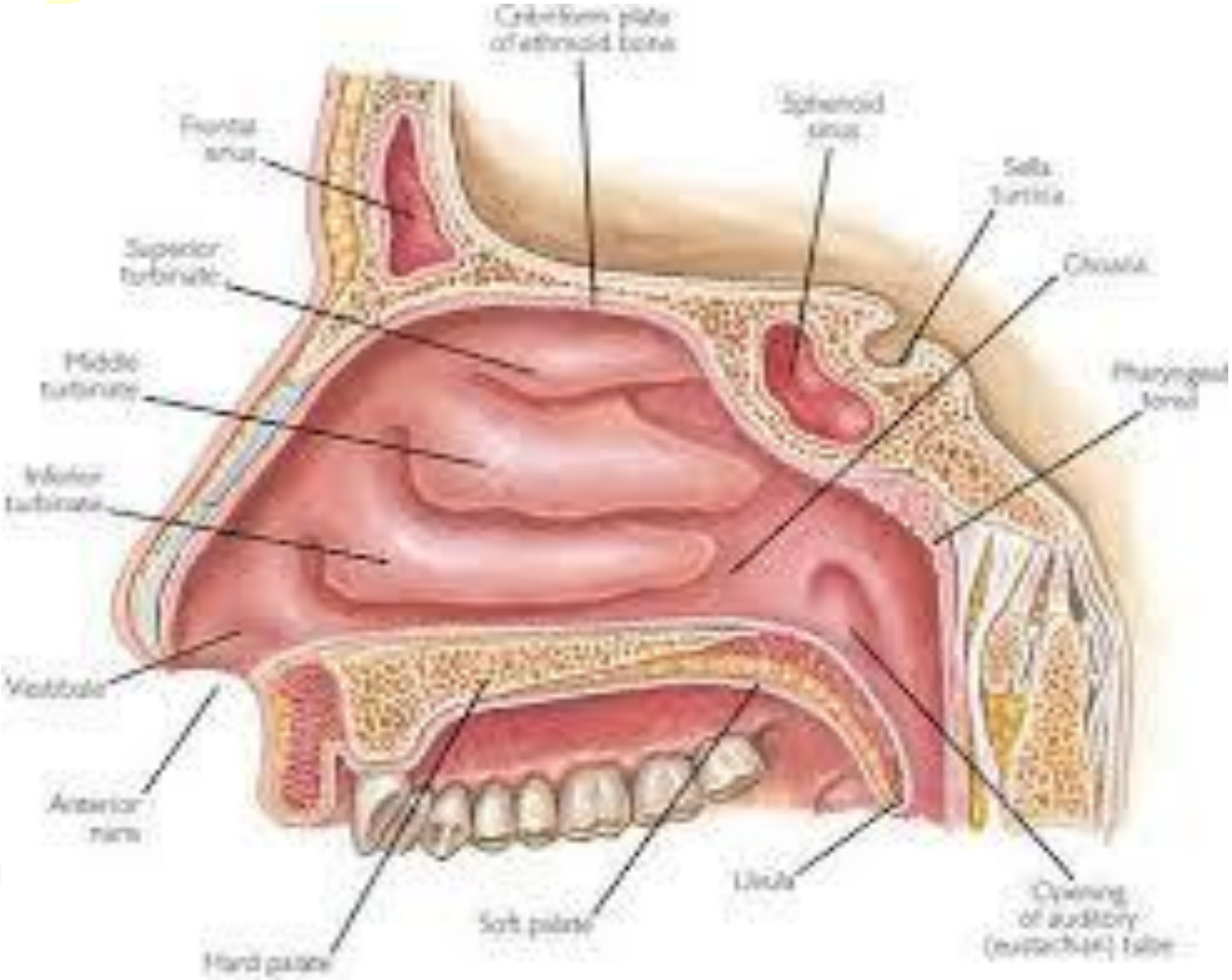
The "big picture" of respiration



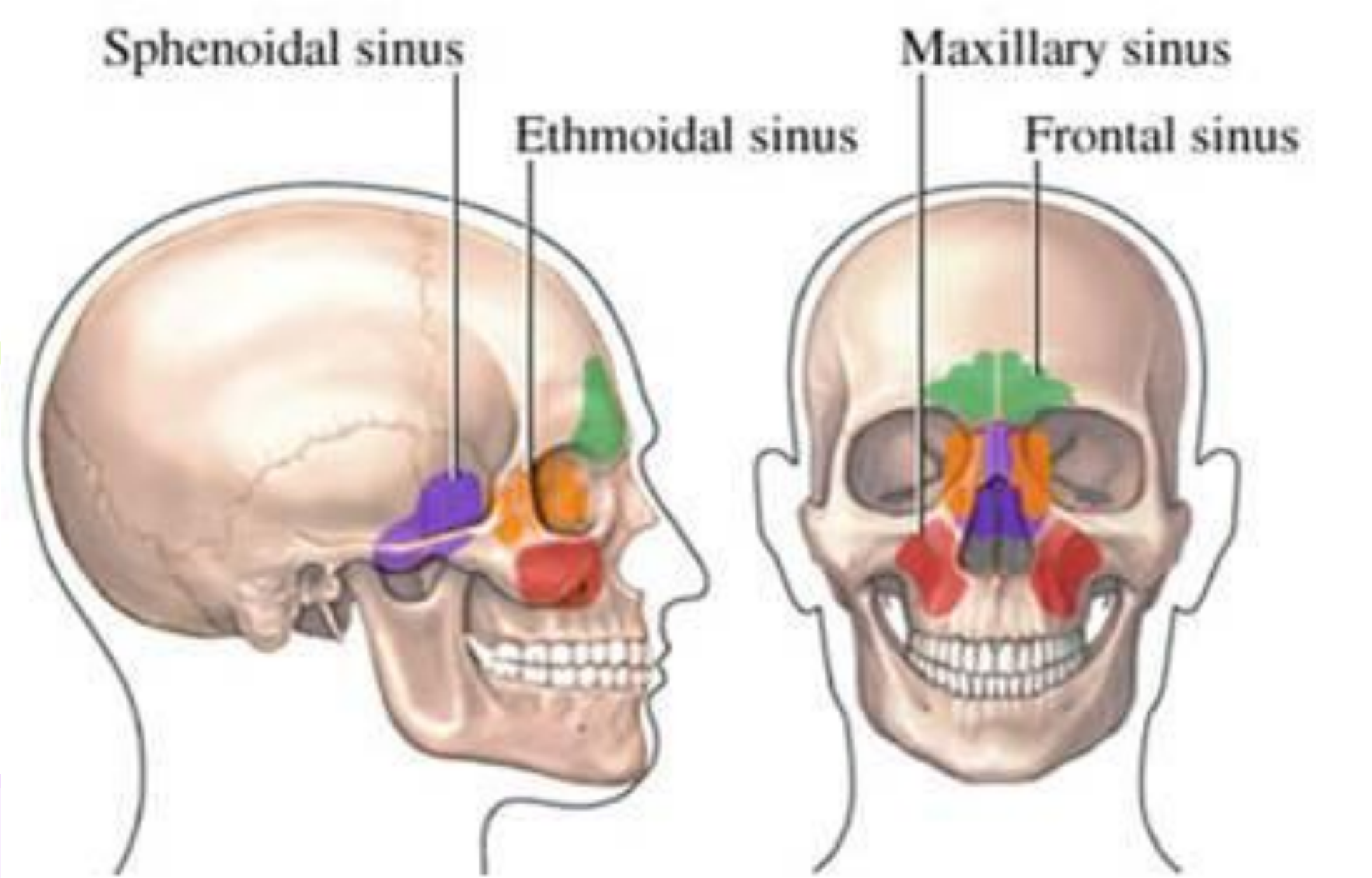

Airways
Bony Structure
Lungs
VENTILATION
Pleura
Respiratory Muscles
Nervous System



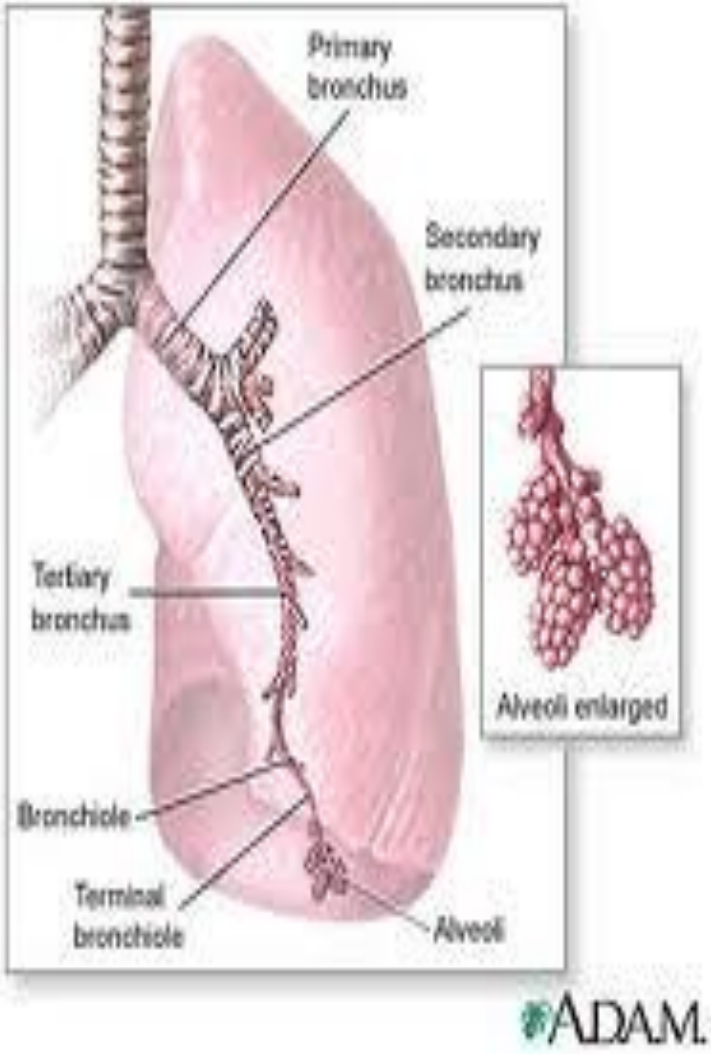
UPPER RESPIRATORY TRACT

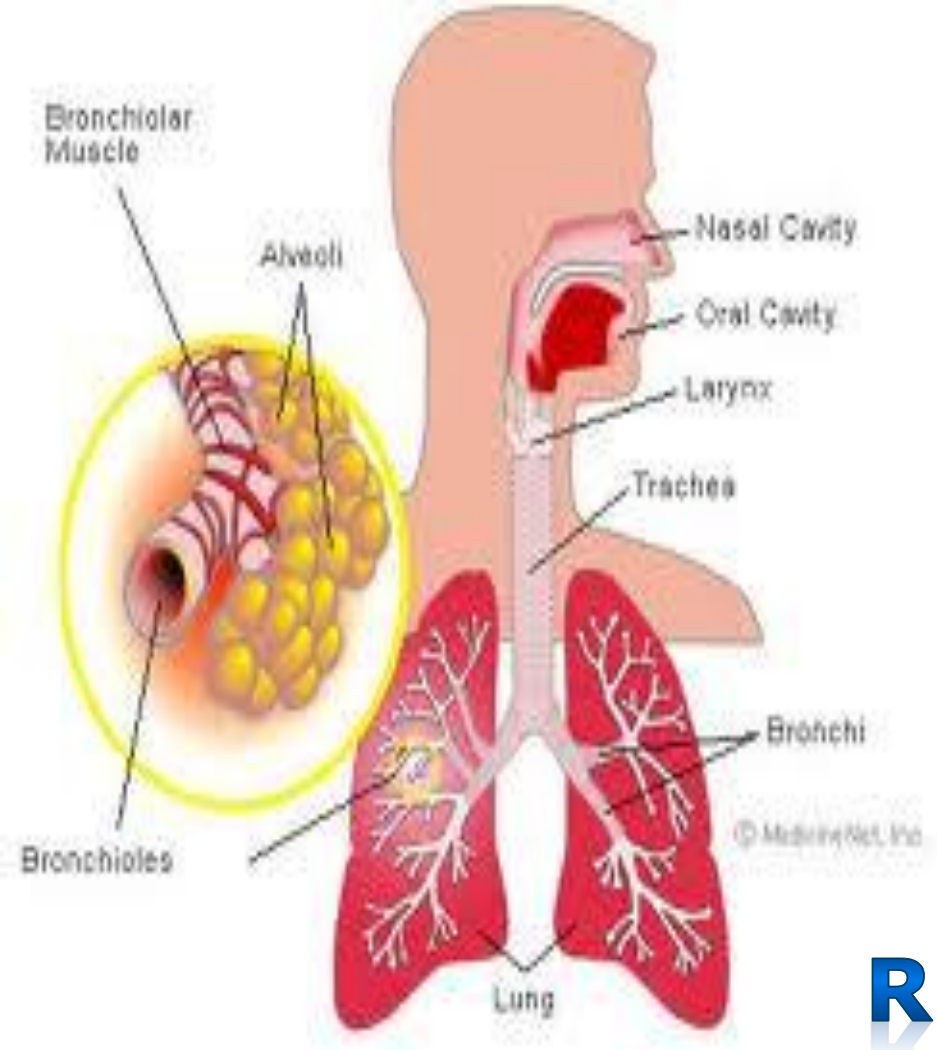


NASAL CAVITY



PARANASAL SINUSES





LOWER RESPIRATORY TRACT

Mucociliary Scala

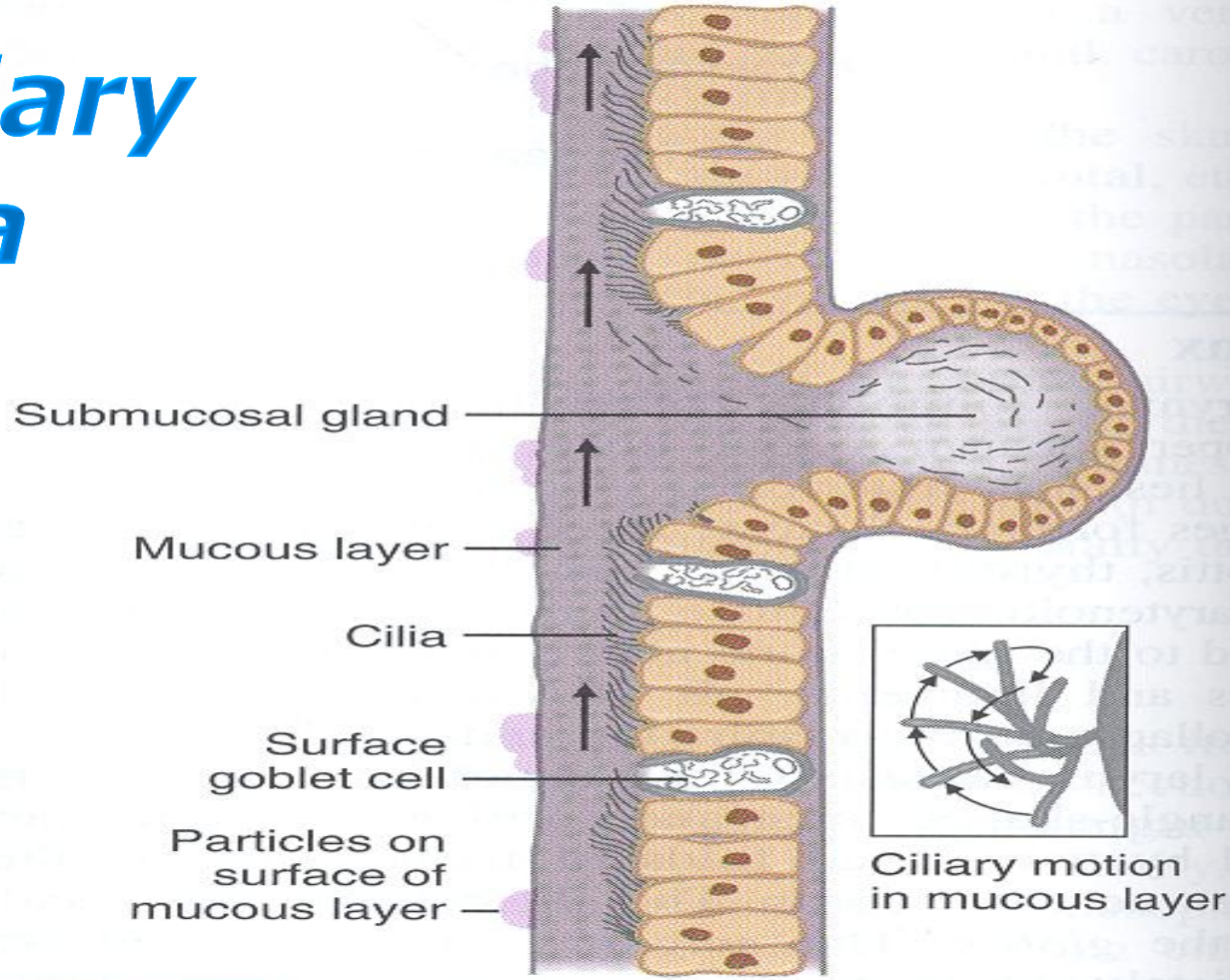
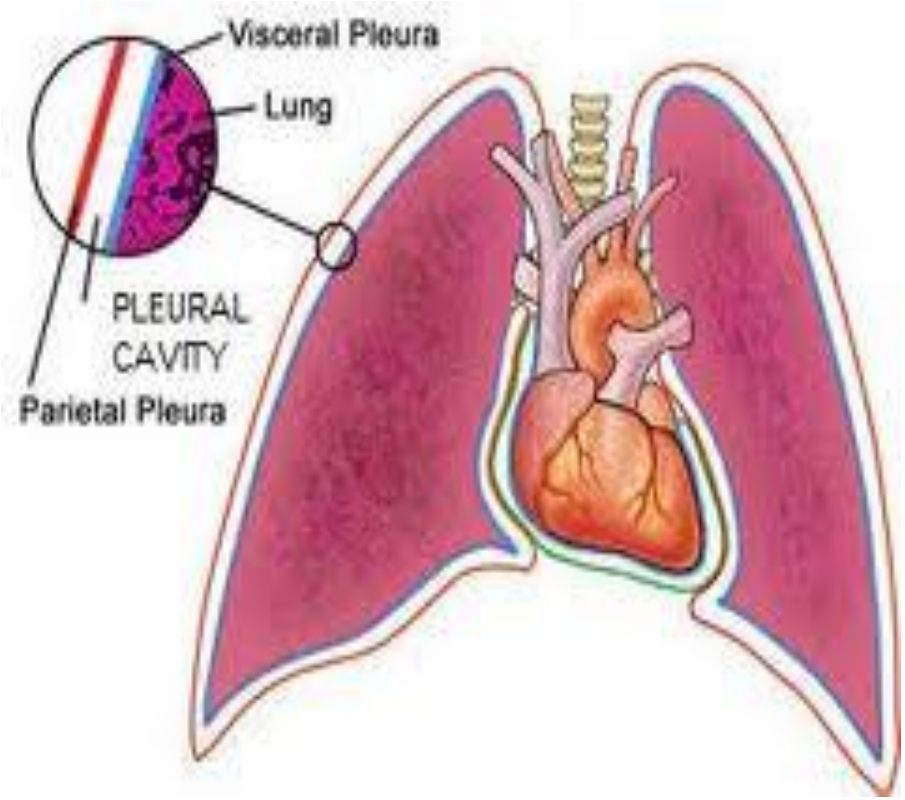
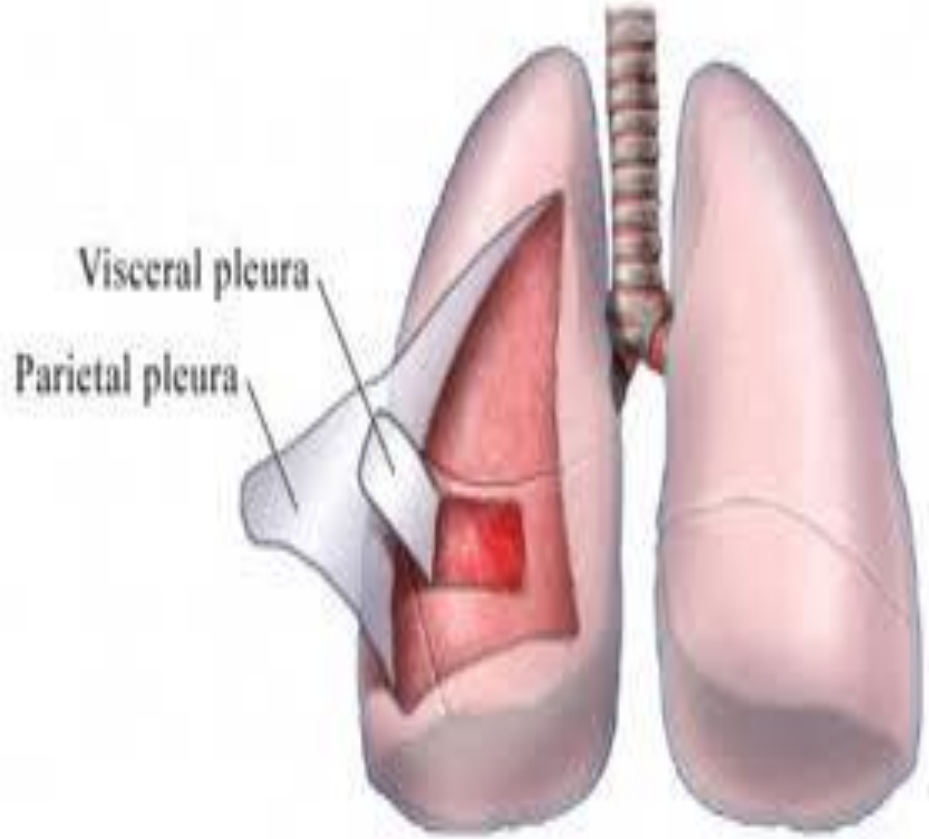


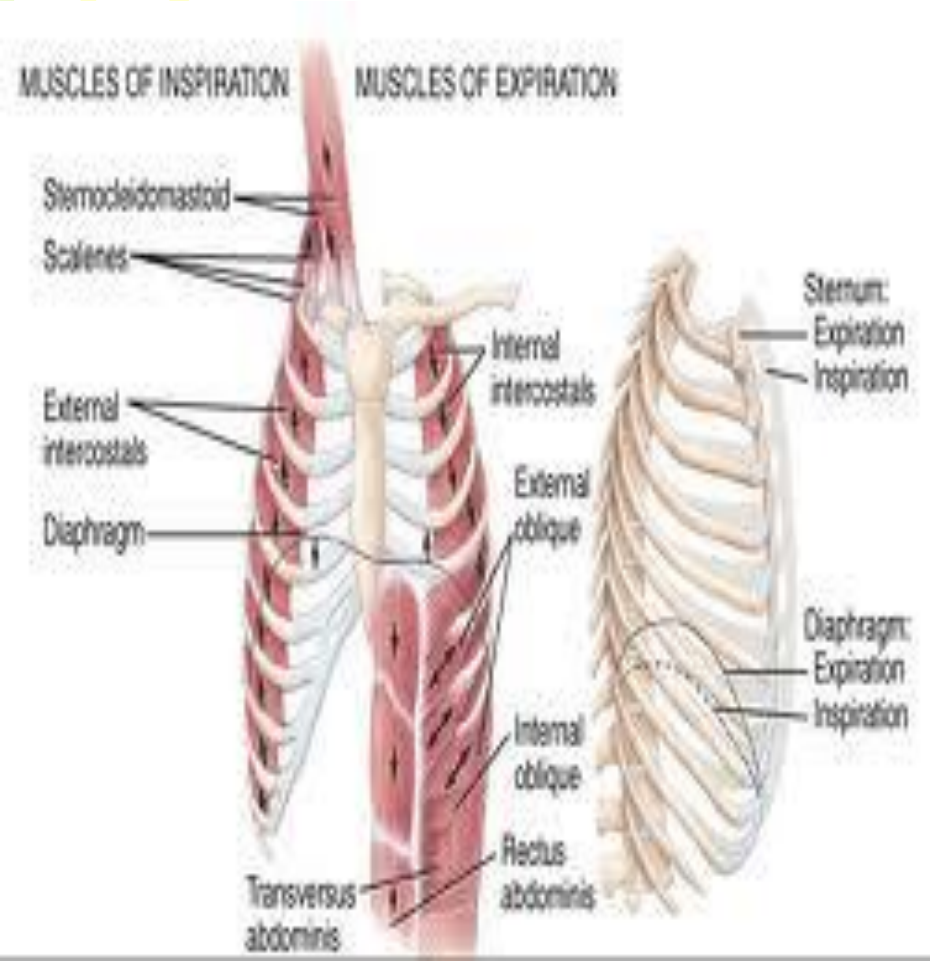
FIGURE U13–3 The mucociliary blanket is an important respiratory defense mechanism. Mucus is secreted by surface goblet cells. About 100 ml of mucus is normally secreted each day by the submucosal glands. Mucus covers the epithelial lining of the tracheobronchial tree in two layers—the watery solution layer close to the mucosal surface and the thicker gel layer. The cilia (hair-like projections) beat in an upward direction toward the upper airway. Particulate matter is trapped on the mucous layer and moved upward by the cilia. Debris-laden mucus is then either swallowed or expectorated as sputum.

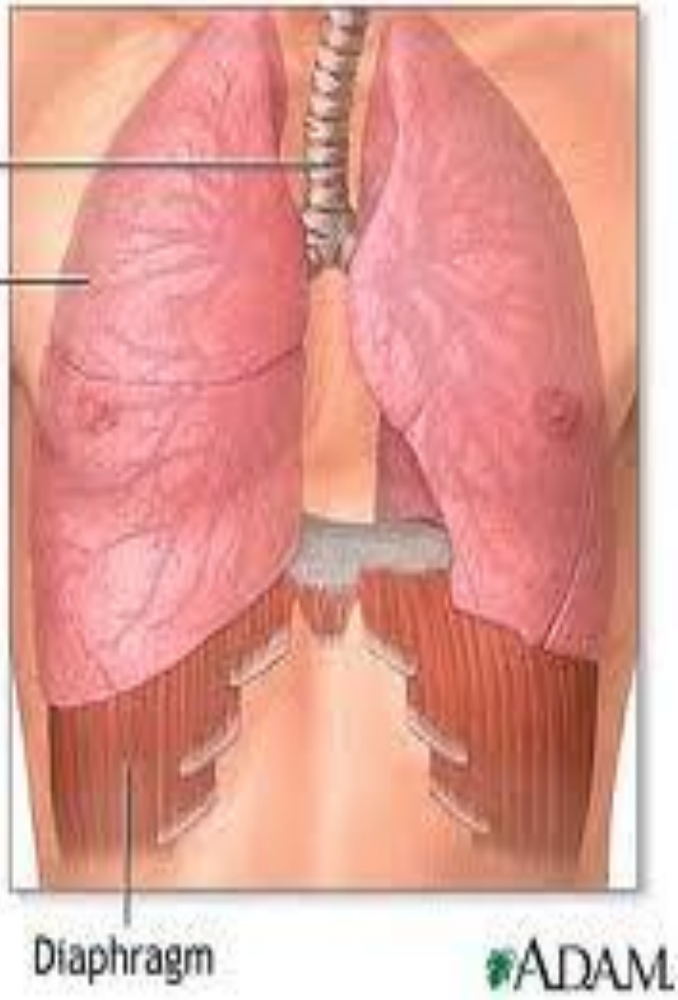

Visceral Pleura
Lung
PLEURAL
CAVITY
Parietal Pleura


Visceral pleura
Parietal pleura

PLEURA

Respiratory Muscles





Bony Structure

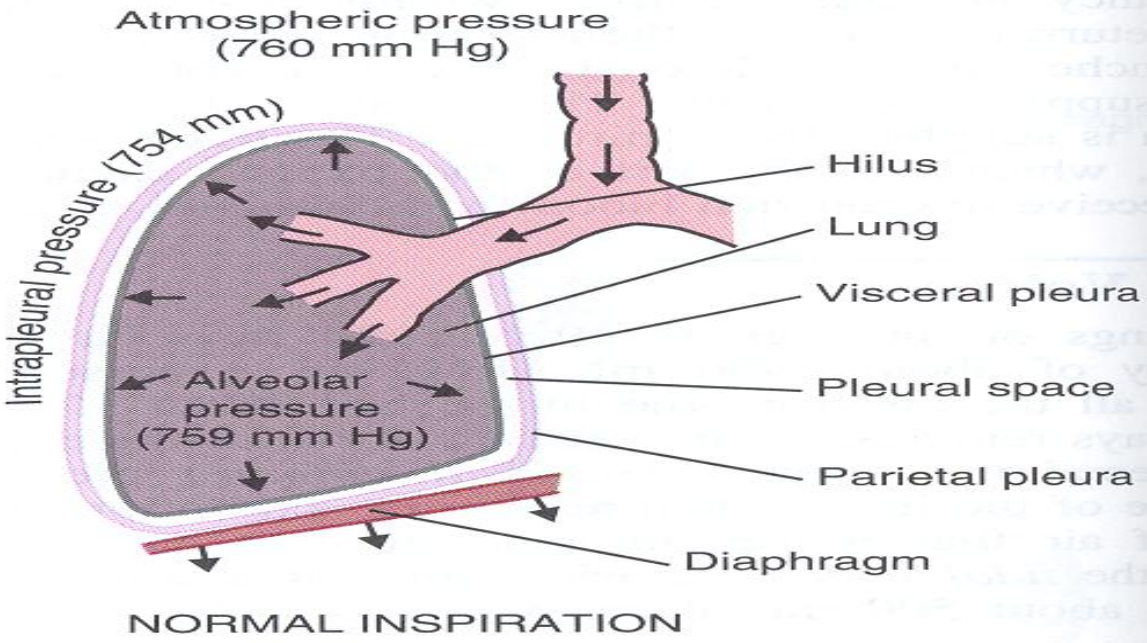
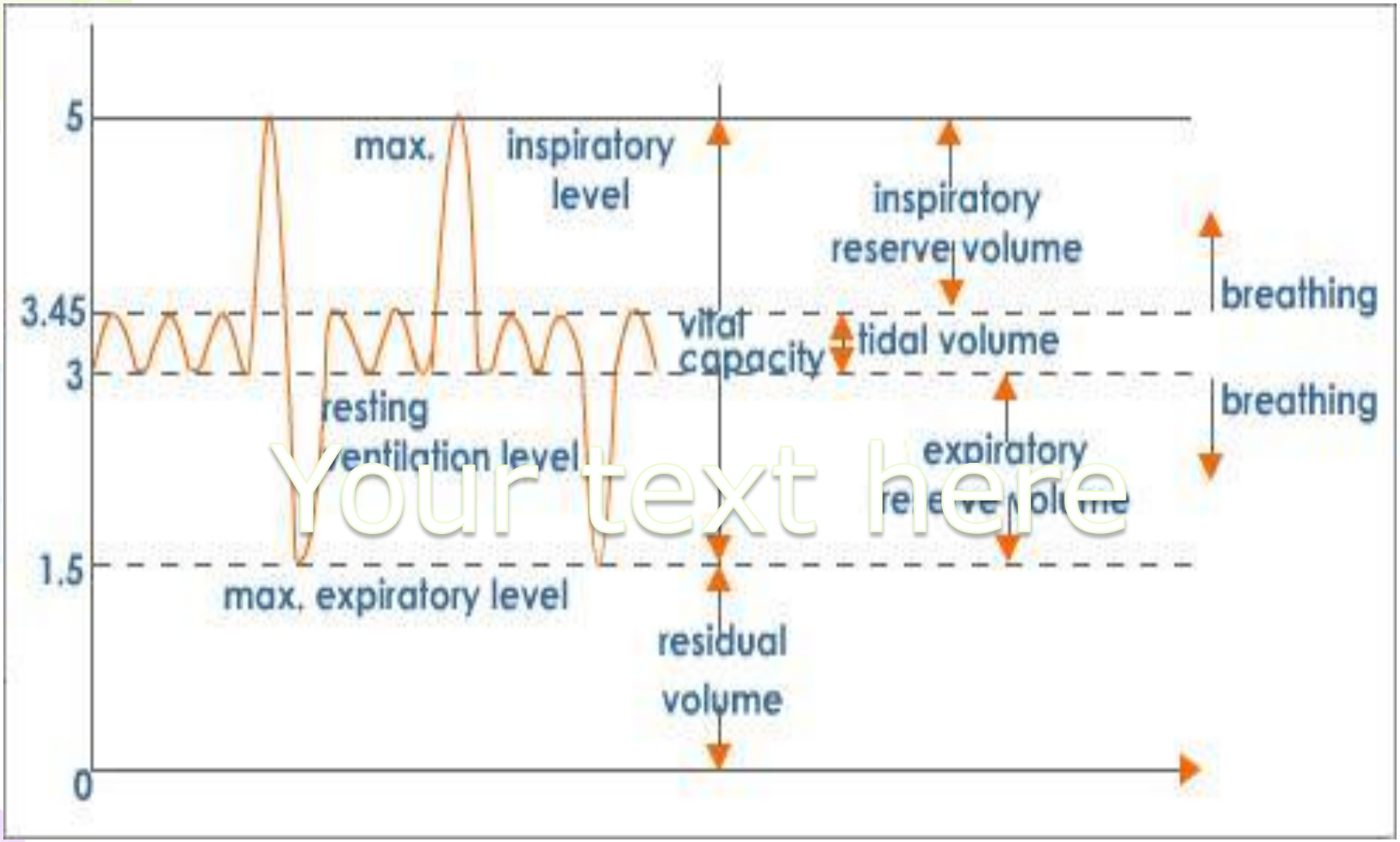
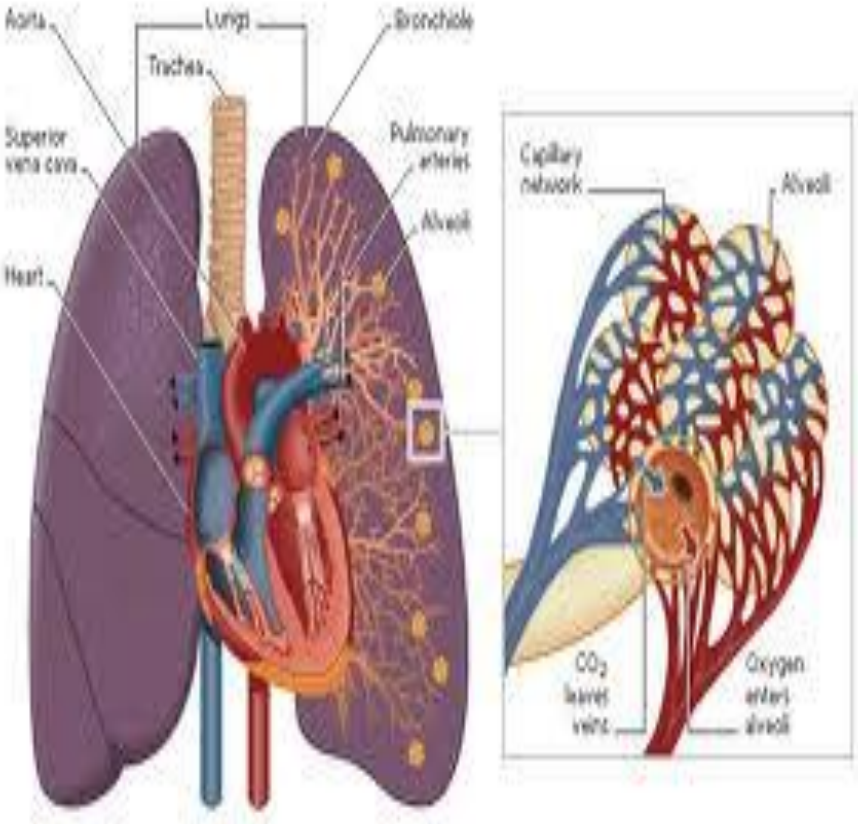


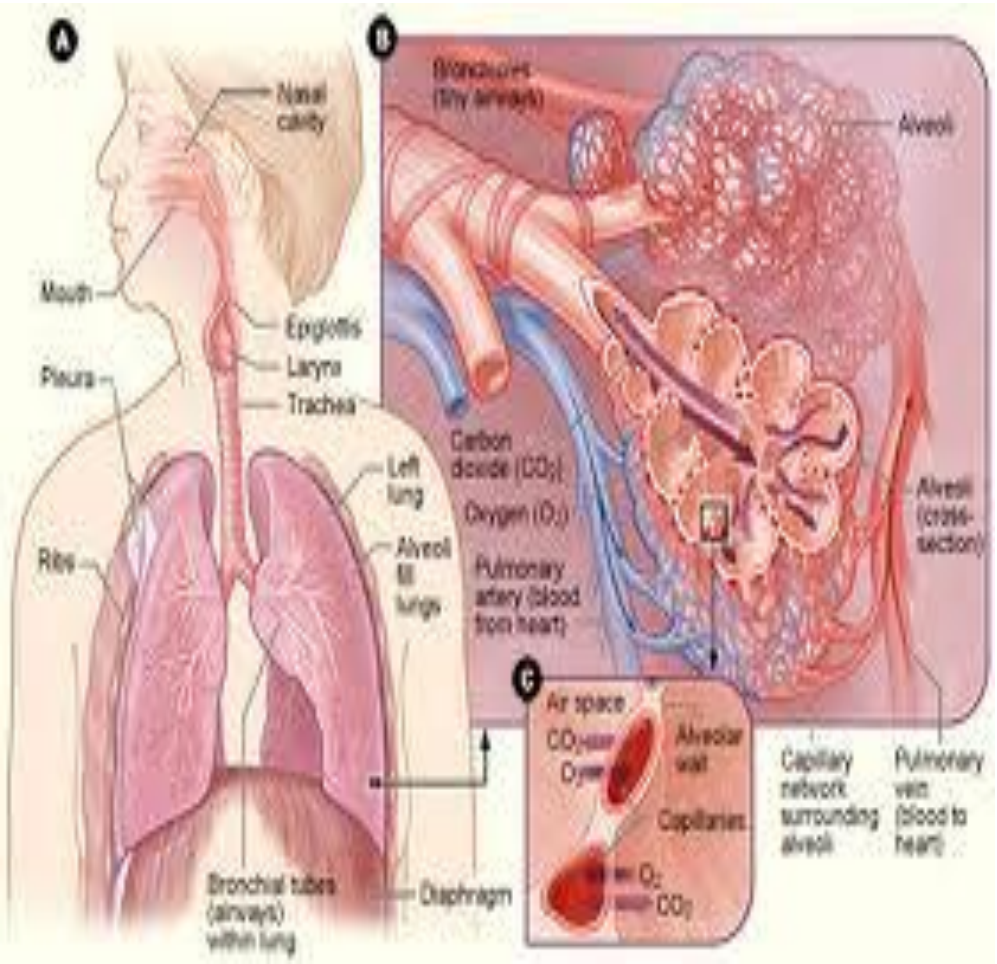
FIGURE U13–7 Normal inspiration and expiration.



Lung Volumes & Capacities

Alveolocapillary Membrane





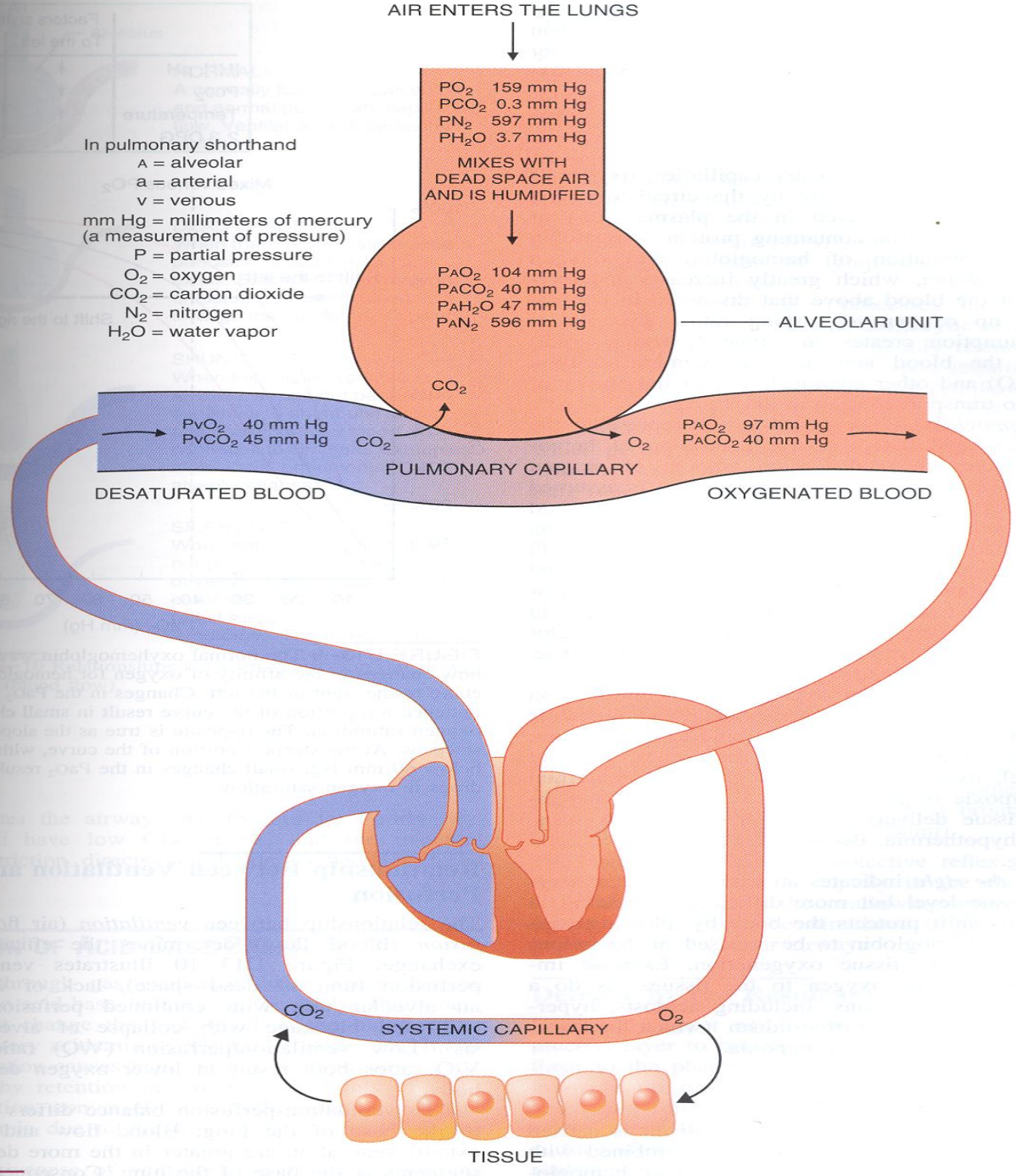


FIGURE U13–8 Partial pressures of gases during normal respiration.

PERFUSION & DIFFUSION

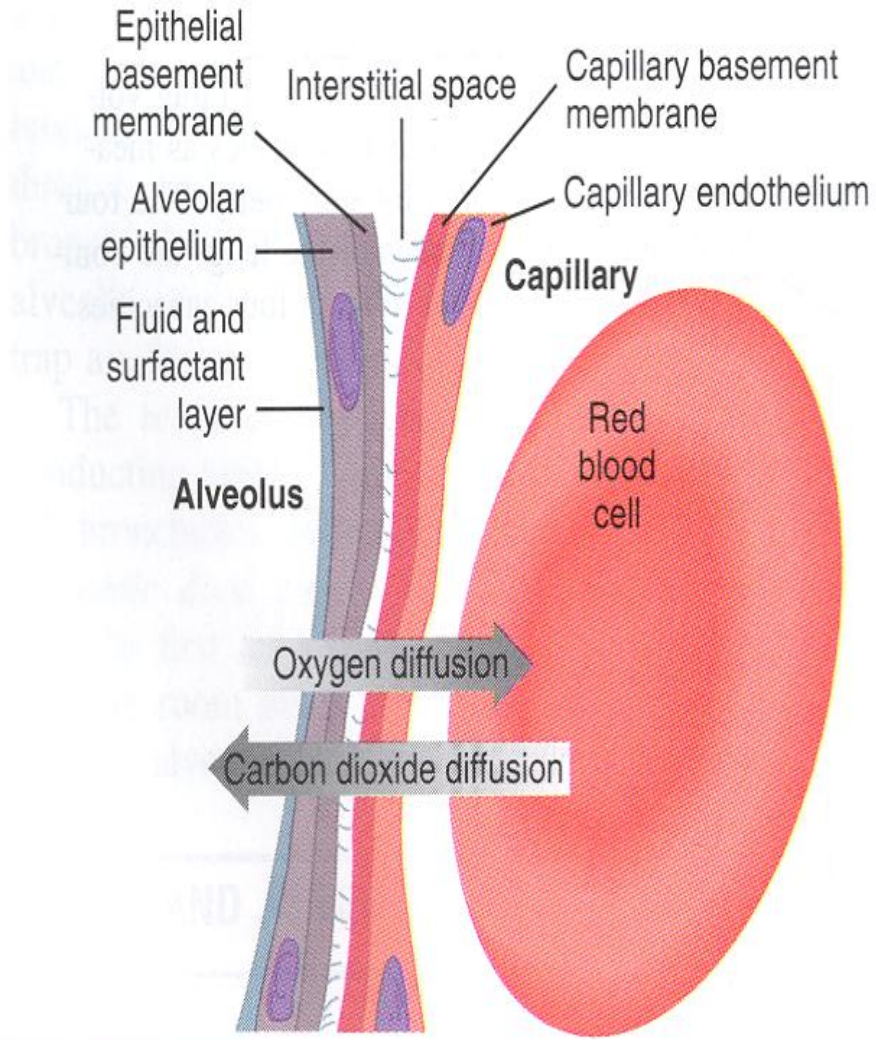
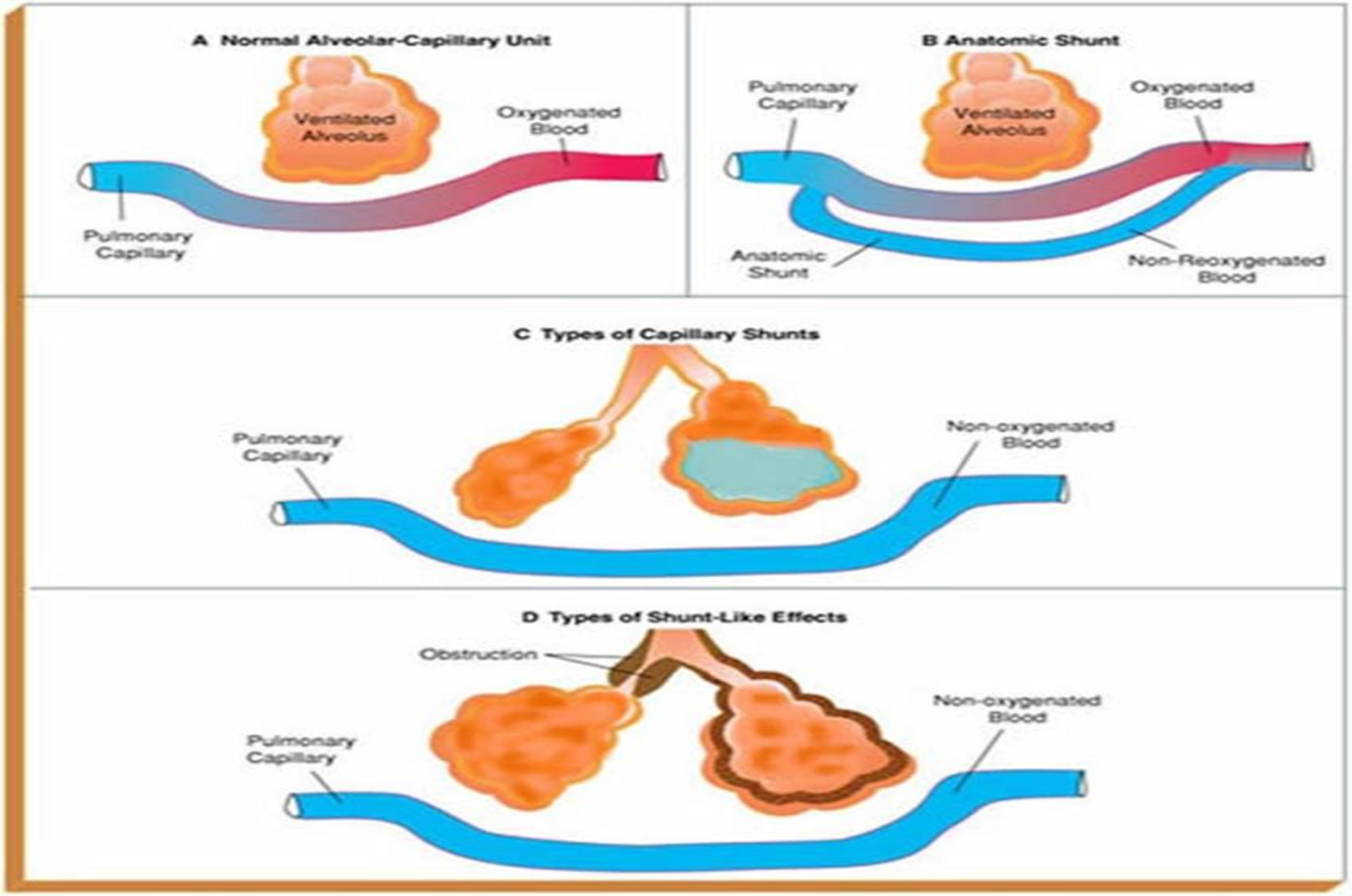


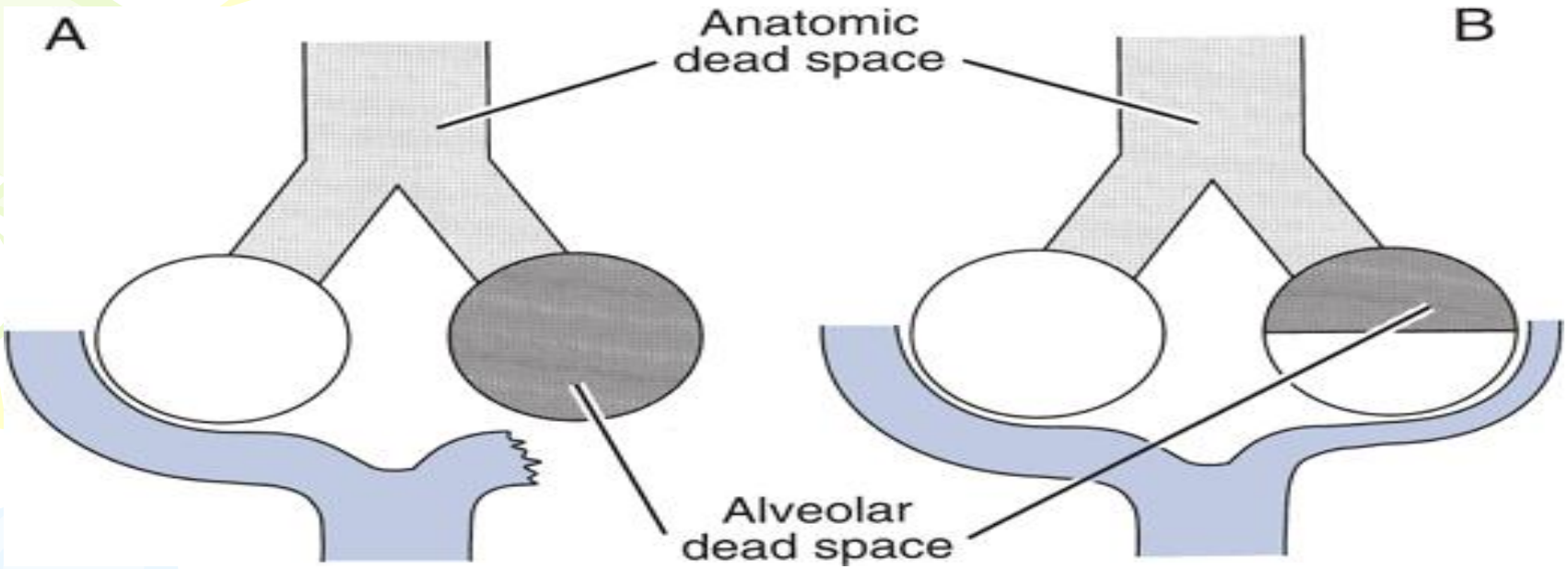
FIGURE U13–6 The ultrastructure of the respiratory membrane, where oxygen is exchanged.

V/Q Ratio Mismatching

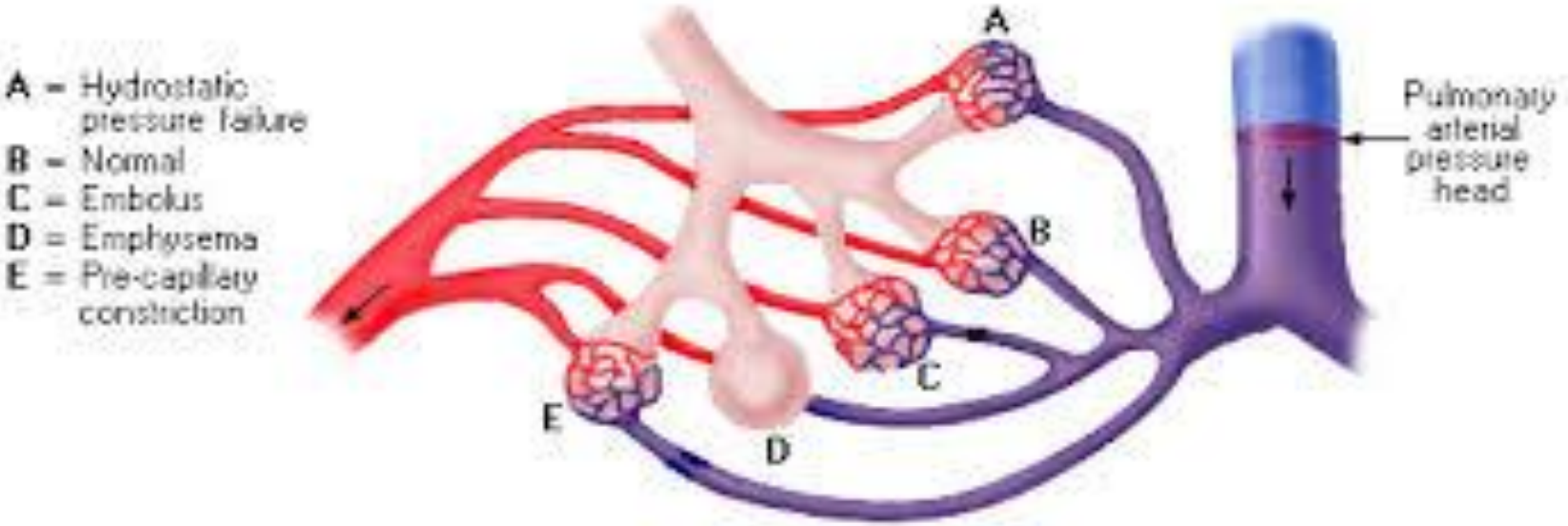
- Shunting
- Dead Space

PULMONARY SHUNTING





Alveolar Dead Space

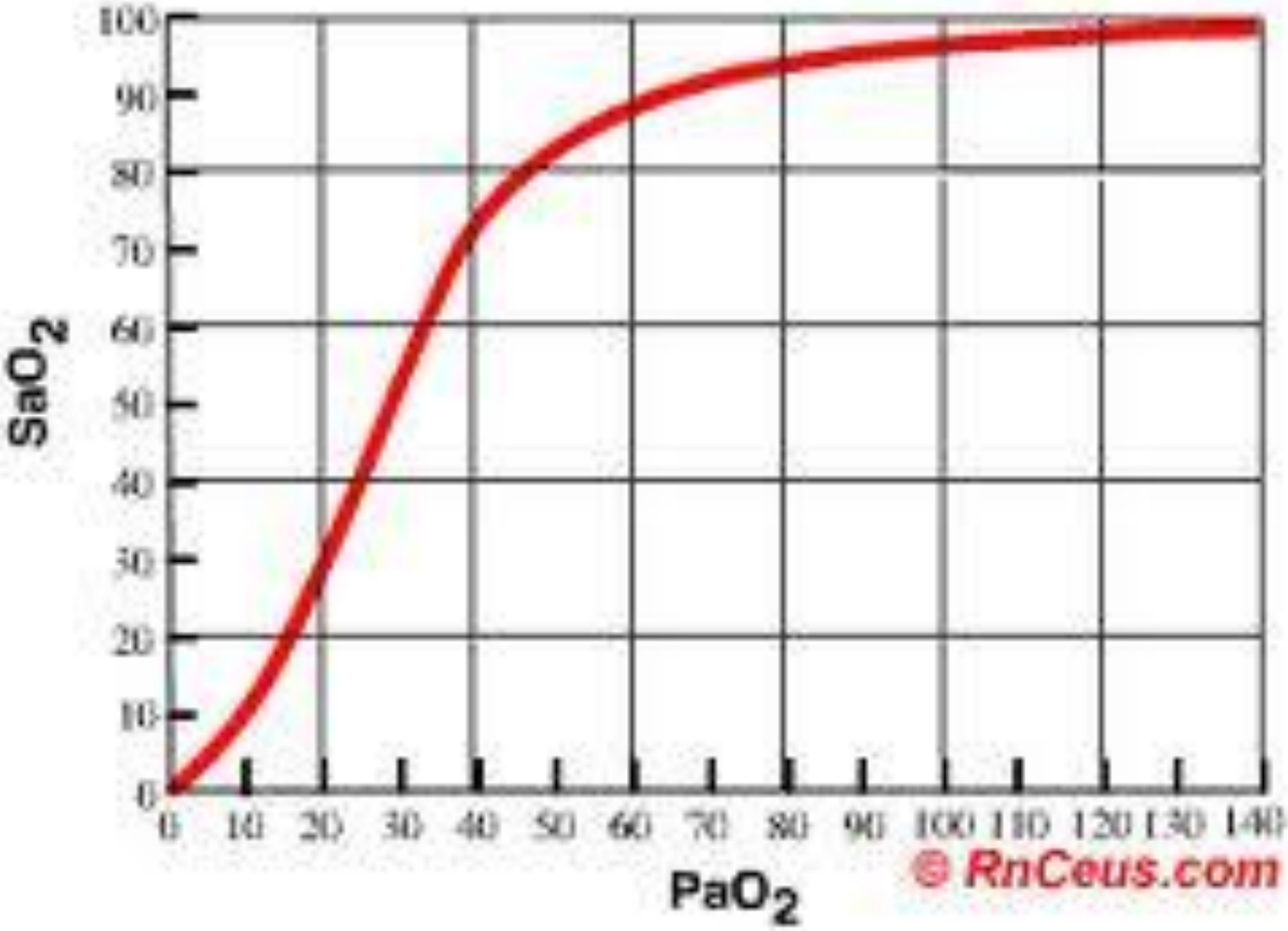


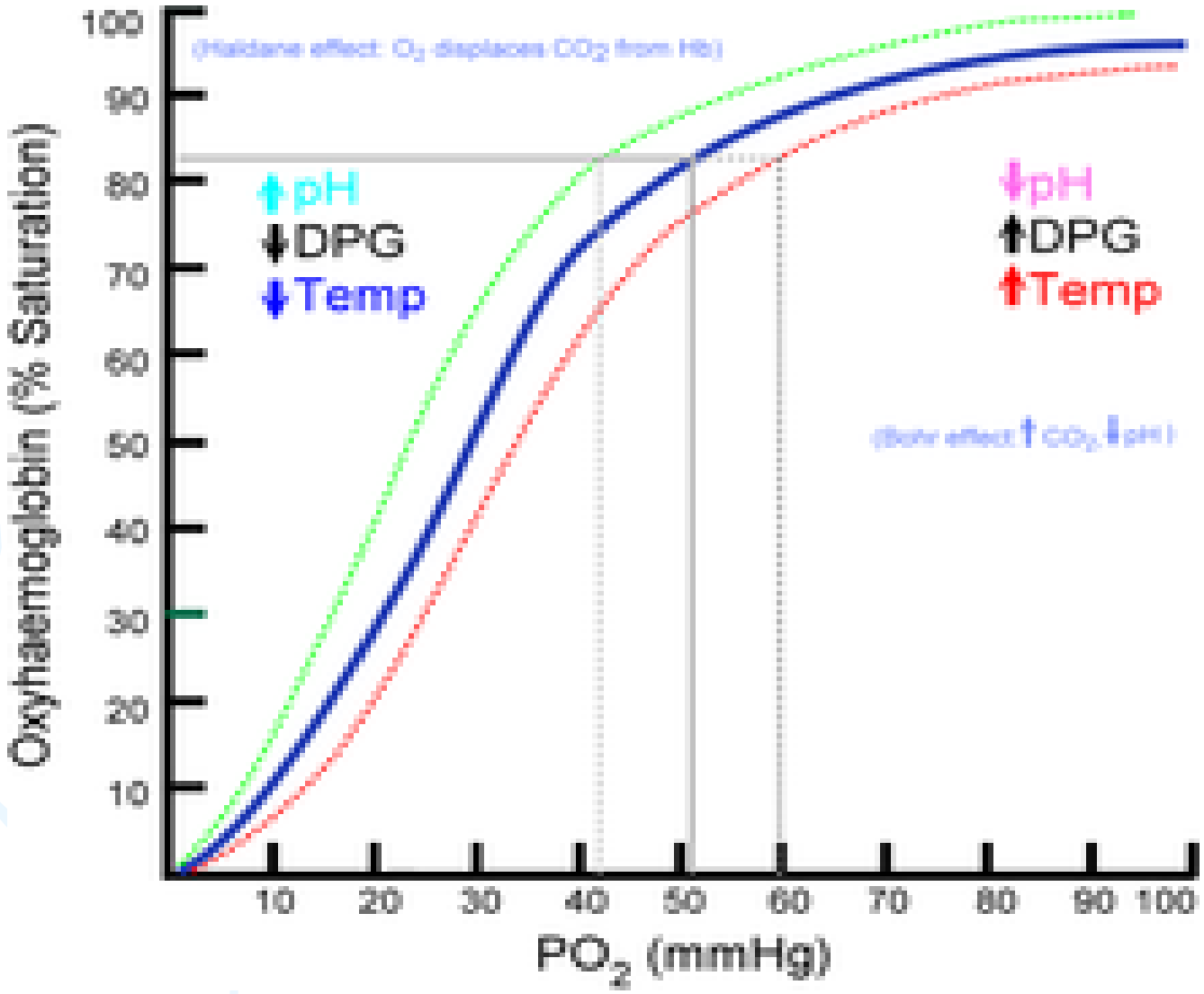
Gas Transportation

O_2 : -Plasma(S)
- HbO_2

CO_2 : - Plasma(S)
- $HbCO_2$
- Co_3H

OxyHemoglobin Dissociation Curve




(Haldane effect: O_2 displaces CO_2 from Hb)
↑pH
↓DPG
↓Temp
↓pH
↑DPG
↑Temp
(Bohr effect ↑ CO_2, ↓ pH)
Oxyhaemoglobin (% Saturation)
100
90
80
70
60
50
40
30
20
10
10
20
30
40
50
60
70
80
90
100
PO_2 (mmHg)

CORTEX

NEURAL

PONS

CONTROL OF BREATHING

MEDULLA

CENTRAL CHEMORECEPTORS

CHEMICAL CONTROL OF BREATHING

PERIPHERAL CHEMORECEPTORS

Control of Breathing